

DOCUMENT RESUME

ED 120 696

CS 002 528

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TITLE The Effects of Specificity and Position of Written Instructional Objectives on Learning from Lecture.
PUB DATE 76
NOTE 20p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, April 1976)
EDRS PRICE MF-\$0.83 HC-\$1.67 Plus Postage
DESCRIPTORS *Behavioral Objectives; Educational Research; Incidental Learning; Intentional Learning; *Learning; Learning Motivation; *Lecture; Phonotape Recordings; *Tape Recordings; *Teaching Methods

ABSTRACT

The effects of specificity and position of written instructional objectives on learning from an audiotaped lecture were investigated using materials from Rothkopf and Kaplan (1972). Subjects received either specific or general objectives before or after the four sections of the lecture. A control group received no objectives. Vocabulary items used throughout the experiment served as the covariate in analysis. Results indicating a departure from previous findings on the use of objectives with written text showed that the before position increased intentional learning over the after position. Incidental learning was significantly higher than intentional learning for treatment groups combined and particularly for the after groups. (Author)

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The Effects of Specificity and Position of
Written Instructional Objectives on Learning from Lecture

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Presented at the annual convention of the American Educational
Research Association, April, 1976, San Francisco.

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Ten years ago, Ernst Rothkopf (1966) initiated a program of research designed to test the hypothesis that learning from text materials could be enhanced by having the learner respond to embedded questions as he proceeded through the text. This initial study, and a number of others which followed (e.g., Frase, 1976, Rothkopf and Bisbicos, 1967; Frase, 1968), demonstrated that subjects encountering questions prior to reading the relevant text retained the question-relevant material better than did subjects who had not read the questions, and that subjects who encountered the questions after reading the text retained both question-specific and incidental (material not tested by questions) material better than did subjects who read the text without questions.

The fact that the learning of selected content in a prose passage could be greatly enhanced by asking the learner questions about that content suggested the possibility that learning could also be enhanced by providing the learner with a set of instructional objectives.

In an initial study Rothkopf and Kaplan (1972) found that specific objectives enhanced intentional learning more than general objectives (also, Kaplan 1974) that intentional learning was greater than incidental learning (also, Kaplan & Simmons 1974) that intentional learning decreased as density (the proportion of sentences in the text relevant to at least one instructional objective) increased, and finally that both intentional and incidental learning were greater for objectives groups than the control group (also, Kaplan 1974).

In an attempt to simplify the effects of density, Kaplan and

Rothkopf (1974) determined that intentional learning was affected by increasing the number of objective-relevant sentences but not by varying passage length.

Regarding position of objectives, Kaplan and Simmons, (1974) found that pre-objectives enhanced intentional learning, but that pre- and post-objectives enhanced both intentional and incidental learning. Presentation of objectives in part produced greater intentional learning than whole (massed) presentation (Kaplan, 1973). Considering mode of presentation, Kaplan and Burgin (1974) found that intentional learning from both text and videotape was increased with the use of objectives.

Kaplan (1974) found no significant differences between requiring overt and covert responses from subjects with regard to intentional learning. Covert responses resulted in significantly higher incidental learning particularly in the case where objectives were interspersed throughout the text.

The results of the studies reviewed above indicate that when adjunct objectives are used several factors significantly affect intentional and incidental learning from prose or taped presentation of material. These factors are position and distribution of objectives in text, specificity of objectives, response mode, mode of presentation of text material, number of passage sentences and objective-relevant sentences.

PROPOSED RESEARCH

The focus of this study was to determine if results obtained from research on the use of objectives with written text would hold if objectives were presented adjunct to an audiotaped lecture. Therefore, the primary purpose of this study is to examine the effects of written instructional objectives on learning from audiotaped lecture. Although the present study did not vary the modes of presentation of instructional material, it is important to note the following differences inherent in audiotaped vs written presentation.

Audiotaped presentation is 1) linear, 2) constant and 3) requires much memory storage of information. Considering each of these facts—linear flow of material simply means that the student cannot "back up" and re-read a sentence he may have missed or misunderstood. No review possibilities are available. Constant rate of presentation signifies that different listening rates of individuals cannot be accommodated. All subjects must attempt to comprehend all the material at the same rate. When subjects are not given a written copy of the audiotaped lecture and are not allowed to take notes, all test information they attempt to comprehend must be stored in memory.

From the literature it is known that objectives should be specific enough, appropriately placed and numerous enough to substantially facilitate learning. Another purpose of this study then is to investigate the effects of specificity (specific, general) and position (before, after text) of objectives on relevant and incidental learning.

Considering the results from previous relevant studies and the

differences inherent in audiotaped presentation of material compared to written presentation, the results of the present study were predicted as follows; the after-text position and specific objectives will result in significantly greater performance on the final criterion test than the before-text position and general objectives respectively; post-text objectives, and specific objectives would enhance intentional learning more than incidental learning. Also, intentional learning was predicted to be higher than incidental learning and treatment groups were expected to perform better than the control group on the final criterion text.

METHOD

Design and Subjects

There were five groups in the study, four of which received treatments that differed in specificity of objectives (specific, general) and the position at which the objectives were presented (before or after the relevant material). The fifth group was a control group (C) which heard the passages without objectives. The subjects in the four treatment groups received one of the following combinations of objectives: specific objectives before the passages (SB); specific objectives after the passages (SA); general objectives before the passages (GB); or general objectives after the passages of material (GA).

One-hundred eighty-four undergraduate psychology students served as subjects in the experiment. Each subject was randomly assigned to one of the five groups. Of the original 184, 17 subjects failed to follow directions and were not included in the analyses. An additional 7 subjects were randomly dropped to equalize the number of subjects in each group. Thus, the final sample consisted of 160 subjects, 32 of which were assigned to each of the five groups.

Materials

The materials used in the study consisted of a prose passage entitled, "Computer Development in the Bell Telephone System", a list of specific and general objectives drawn from the passage and a 52-item criterion test which measured learning from the passage. These materials were identical to those used in Rothkopf and Kaplan (1972). In addition,

a vocabulary test was administered to all subjects in the experiment. This test served as a filler task during various points in the experiment and as a potential covariate in the data analyses.

Lecture Passage

The lecture passage used in the experiment contained 1,091 words distributed across 54 sentences. The entire passage has a density level of 60%. When the lecture was prepared for taping, it was divided into four sub-sections based on content coherence, length of sub-section, number of specific or general objectives relevant to each sub-section and maintenance of 60% density within each of the sub-sections.

Prior knowledge of the passage content was assessed in a pilot study using a group of students similar to the intended sample and was determined not to be of concern in the study.

Objectives

Thirty-three specific and twelve general objectives accompanied the lecture passage. A general objective was defined as being relevant to the content in 2-5 adjacent sentences of text material, while specific objectives were relevant to only one sentence in the text. Each instructional objective was a single sentence or phrase which described a relevant learning outcome.

The relevance of objectives to text sentences had previously been ascertained in a study by Rothkopf and Kaplan (1972).

Tests

Fifty-two short answer or fill-in-the-blank questions comprised

the final test. A test question was prepared for almost every sentence in the passage by rephrasing the text sentence and replacing significant words with blank lines of uniform length for student response. Of the 52 questions, 33 were relevant to both an objective and a text sentence (intentional), and 19 were relevant only to a text sentence (incidental). The questions were arranged in random order on the test. In a previous study, Kaplan and Simmons (1974) varied the order of the questions in the final test and found no significant difference in performance on the test due to question order.

Vocabulary Questions

Thirty-six multiple choice vocabulary questions of varying difficulty were administered in groups of nine to all subjects. These items were obtained from the Kit of Referenced Tests for Cognitive Factors (French, et al., 1963). An additional thirty-six questions of varying difficulty were prepared for filler material for the control group. The distractors for these 36-vocabulary questions were obtained by administering the vocabulary words in an open-ended test to a group of students who were required to write what they thought the meaning of each word was. The incorrect responses were checked for plausibility and combined with the correct answer to provide the multiple choice for the questions.

Timing

Before beginning the major experiment, a pilot study was run to determine the appropriate timing sequences necessary for satisfactory

completion of the tasks involved in the study. Three versions of the first subsection of the passage (18 sentences) were prepared at a fast speed (2 minutes), a moderate speed (3.5 minutes) and a slow speed (5 minutes). Ninety percent of the subjects listening to the passages presented at these speeds agreed that the presentation at moderate speed was easiest to follow and provided the best opportunity for learning. In addition, it was determined that 18 minutes was sufficient time for 90% of the pilot subjects to complete the criterion test, and 2 1/2 minutes sufficient time to complete each experimental task (i.e., vocabulary questions and reading objectives).

Procedure

The materials (objectives, vocabulary questions and final test) for the experiment were organized into five different booklets corresponding to the five treatment groups in the study. The booklets were randomly assigned to the subjects when they arrived for the experiment. The cover of the booklet directed them not to open their booklets until the tape had instructed them to do so. Subjects were not aware that they would receive different treatments. Once the tape was begun, subjects arriving late were not allowed to enter the room. The tape gave a one-minute introduction stating that the tape would play four sub-sections of a lecture once only, that the subjects would be tested after all the lecture had been read, that the time allotments for all tasks would be specified, and that the tape would direct them to the appropriate pages they should follow in their booklets.

The subsequent sequence of all events and the times allotted for each task for all subjects is contained in Table I.

Insert Table I about here

Scoring

The answer key for the vocabulary questions allows for only one correct answer per question. The answer key for the final test provides all acceptable answers for each question. No response other than those specified was accepted. Partial credit was not given on a question in which a partially correct response was given. The tests which were scored individually each yielded four scores; the number of correct vocabulary answers, the number of correct intentional questions, the number of correct incidental questions and the total number of correct incidental questions and the total number of correct criterion test responses. Each of these numbers was converted to a percentage based on the total number of items in each of these four groups.

RESULTS

Vocabulary scores correlated highly (average $r = .48$) with intentional and incidental learning to warrant using vocabulary scores as a covariate in an analysis of covariance.

Two multivariate analyses of covariance examined the data for main effects and interactions. A 2 (position) X 2 (specificity) multivariate analysis of covariance with intentional and incidental learning scores as dependent variables was conducted to determine if there were differences in the dependent variables due to position and specificity of objectives for the four treatment groups (SB, SA, GB, GA). A one-way multivariate analysis of covariance compared all 5 groups for differences in the two types of learning.

Insert Table II about here

The results of the 2 X 2 multivariate analysis of covariance yielded the following findings for the four treatment groups (SB, SA, GB, GA). The main effect due to position of objectives was significant ($F = 5.84$, $df\ 2/122$, $p < .01$) for both dependent variables combined. In the subsequent univariate analyses, testing each dependent variable separately, position was significant for intentional learning ($F = 11.61$, $df\ 1/123$, $p < .01$) but not for incidental learning ($F = 1.06$, $df\ 1/123$, $p > .05$). Judging from the means, the before text position ($\bar{x} = 37.92$) accounts for greater intentional performance than the after text position ($\bar{x} = 32.94$). This result is similar to a univariate position X learning interaction. Neither position enhanced incidental

learning significantly. In addition, the main effect of specificity did not reach significance, indicating that neither level of specificity affected the types of learning. Finally, the interaction between specificity and position was not significant.

A univariate analysis of variance was performed to test for differences in learning and for interactions of learning with position and specificity. In the univariate $2 \times 2 \times 2$ analysis, it is interesting to note that the only main effect that reached significance was learning ($F = 7.62$, $df\ 1/124$, $p < .01$), favoring incidental learning ($\bar{x} = 38.34$) over intentional learning ($\bar{x} = 35.42$) across all treatment groups. This result has not been found in previous studies which examined the effects of objectives or questions on types of learning.

The one-way multivariate analysis of covariance compared all experimental groups (SB, SA, GB, GA, C) for differences in learning. The main group effect was significant ($F = 3.97$, $df\ 8/306$, $p < .01$). In the subsequent univariate tests, it was shown that the groups differed significantly on both intentional learning ($F = 7.34$, $df\ 4/154$, $p < .01$) and on incidental learning ($F = 3.40$, $df\ 4/154$, $p < .01$). An examination of the means suggests that the significant differences in learning across the groups is due largely to the lower intentional and incidental performances of the control group compared to the treatment groups.

An examination of the group means shows that the differences in intentional learning are due largely to position of objective.

In order to compare each treatment group to the control group the one-tailed Dunnett test was performed on the univariate data.

Using the total means for each group the results of the Dunnett tests showed that the SB ($t = 4.02$, $df\ 4/155$, $p < .01$), GB ($t = 5.48$, $df\ 4/155$, $p < .01$) and GA ($t = 3.76$, $df\ 4/155$, $p < .01$) groups differed significantly from the control group in overall performance. The SA group did not differ significantly from the control group ($t = 1.101$, $df\ 4/155$, $p > .05$). In other words, from the significant main group effect, after examining Dunnett tests and examining the means, we further see that overall performance on the final criterion test was significantly greater for the SB, GB and GA groups than for the control group.

DISCUSSION

This study attempted to extend the results of research on learning from text with the use of objectives. Based on the results of the present research, learning from audiotaped lecture is also enhanced by the use of objectives. This generalization of results of learning from text presentation to audiotaped presentation was the primary focus of this study.

The prediction regarding the main position effect favored the post-text objectives for enhancing learning. This prediction was not supported by the results. In fact, the results showed that the pre-text objectives significantly increased learning more than the after text objectives. Since none of the studies reported here have found a main effect on learning due to position of objectives, this result is not contradictory to previous findings.

The prediction for the objective specificity variable was that specific objectives would enhance learning more than general objectives. As was indicated in the results section, this prediction was not confirmed. One possible reason that this prediction was not supported has to do with the use of audiotaped presentation in this study rather than the written presentation format used in previous studies. The audiotaped presentation of materials can be considered to be linear in nature; which means that the subject had one opportunity only to obtain the content relevant to an objective. In addition, the required content for a specific objective was contained in only one text sentence. This means that the subject had one chance while listening to the tape to match the specific objective to its single

corresponding text sentence. It is apparent that this match of objective to single text sentence, during the lecture, could not be successfully completed. The significant interaction of learning and position of objective was also not consistent with results from previous studies.

The results of the present study show that incidental learning was not affected by position of objective, but intentional learning was greatly enhanced by the use of before objectives compared to after objectives. This result may be due to the manner in which subjects in the different position treatments had to attend to the material to obtain the objective-relevant content. First, subjects in the before groups were instructed to learn only the objective-related content, while subjects in the after groups were told to learn all the content of the lecture. Assuming that subjects followed these directions, the before group subjects had to attempt to comprehend only 2/3 of the amount of material as the after group subjects. Also, because of the constant, linear audiotaped presentation, the amount of information required to be held in memory by the subject may be critical. For example, since no objective provides the subject with the answer to an intentional test item the subject must match the objective to the objective-relevant content to insure successful performance on the final test. In order to make this match, the before subjects must hold only the objectives in memory, while the after subjects must hold the entire lecture segment in memory until they can match the objective-relevant content to the objectives which follow the passages. This difference in suggested behaviors may provide a possible explanation of the results.

The specificity by learning interaction which consistently occurred in previous studies, and which was predicted to occur in the present study did not reach significance. The specific objectives which should have enhanced intentional learning were shown to be less effective (although not significantly) than general objectives.

By far, the most interesting result from this study was the significant learning effect showing incidental learning higher than intentional. This result contradicts the findings in all previous studies on questions or objectives which have consistently found intentional learning higher than incidental.

There is, however, an indication of support for this result from Kaplan and Burgin (1974). In that study the difference between intentional and incidental learning decreased when the mode of presenting the material moved from written text to videotape. At that point, intentional learning was only slightly higher than incidental learning. One might expect then that as the presentation mode moved to a totally audiotaped presentation, the incidental learning could exceed intentional learning.

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TABLE I
PROCEDURE OF EXPERIMENT

Task #	GROUPS					Time Allotted
	SB	SA	GB	GA	C	
1	Read Abstract of Lecture					4'
2	Read 11 Objectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	9 Vocab- ulary	24'
3	Tape Reads Lecture Section #1					
4	9 Vocab- ulary	Read 11 Objectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	24'
5	Read 8 Ob- jectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	9 Vocab- ulary	24'
6	Tape Reads Lecture Section #2					
7	9 Vocab- ulary	Read 8 Ob- jectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	24'
8	Read 7 Ob- jectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	9 Vocab- ulary	24'
9	Tape Reads Lecture Section #3					
10	9 Vocab- ulary	Read 7 Ob- jectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	24'
11	Read 7 Ob- jectives	9 Vocab- ulary	Read 3 Ob- jectives	9 Vocab- ulary	9 Vocab- ulary	24'
12	Tape Reads Lecture Section #4					
13	Begin Test		Begin Test		Begin Test	18'
		Read 7 Ob- jectives		Read 3 Ob- jectives		
14		Begin Test		Begin Test		18'
	9 Vocab- ulary		9 Vocab- ulary		9 Vocab- ulary	24'
15	Informational Questions — Demographic Data					1'

The subjects were instructed to close their booklets after completion of task 15.

TABLE II
MEANS OF LEARNING SCORES

Learning	SB	SA	GB	GA	C
intentional	36.31	31.59	39.53	34.28	27.75
incidental	37.56	36.97	40.31	38.53	29.63
Total	36.94	34.28	39.92	36.41	28.69